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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] the pine of this invention -- foliaceous -- a conductor -- it is the shaft-orientations fragmentary sectional view showing one example of the rotation electrical machinery which has a sequential connection type stator coil

[Drawing 2] It is the direction cross section of the diameter of a portion of a stator shown in drawing 1 .

[Drawing 3] It is the perspective diagram showing some stator coils shown in drawing 1 and drawing 2 .

[Drawing 4] It is the perspective diagram showing the front side coil end of the stator coil shown in drawing 1 .

[Drawing 5] a small turn pine -- foliaceous -- it is the side elevation showing a conductor

[Drawing 6] the circumference pine of a large -- foliaceous -- it is the side elevation showing a conductor

[Drawing 7] a pine -- foliaceous -- a conductor -- the front view of a forming roller [ in / a longitudinal direction (shaft orientations) / it is process drawing explaining a production process, and / in (a) ] -- being shown -- (b) -- a bending member -- bending -- passing -- prevention -- a member and interposition -- the side elevation in the cross direction of a member is shown

[Drawing 8] a pine -- foliaceous -- a conductor -- the front view of a forming roller [ in / a longitudinal direction (shaft orientations) / it is process drawing explaining a production process, and / in (a) ] -- being shown -- (b) -- a bending member -- bending -- passing -- prevention -- a member and interposition -- the side elevation in the cross direction of a member is shown

[Drawing 9] a pine -- foliaceous -- a conductor -- it is process drawing explaining a production process

[Drawing 10] a pine -- foliaceous -- a conductor -- the front view of a forming roller [ in / a longitudinal direction (shaft orientations) / it is process drawing explaining a production process, and / in (a) ] -- being shown -- (b) -- a bending member -- bending -- passing -- prevention -- a member and interposition -- the side elevation in the cross direction of a member is shown

[Drawing 11] It is the cross section showing the distance reduction mechanism between forming roller pairs of the bending equipment which carries out the bending process shown in drawing 7 - drawing 10 .

[Drawing 12] It is the side elevation of the bending equipment which carries out the bending process shown in drawing 7 - drawing 10 in which bending and showing move mechanisms, such as a member.

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[Translation done.]

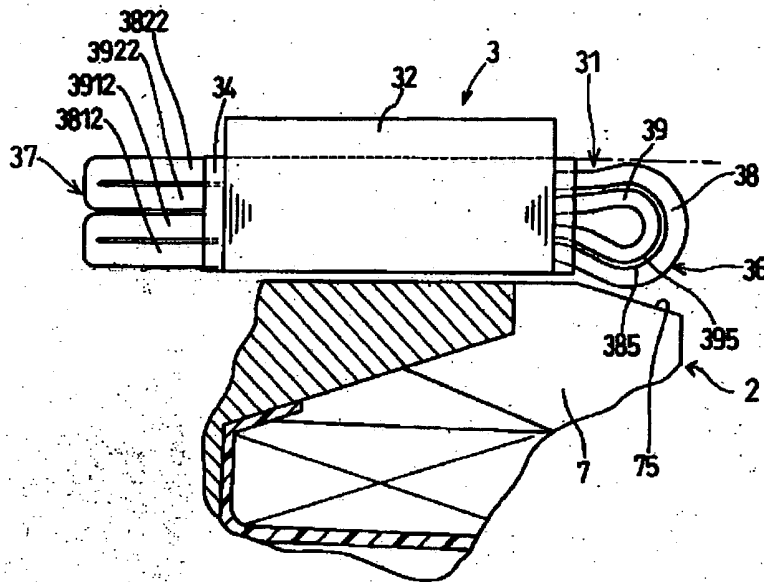
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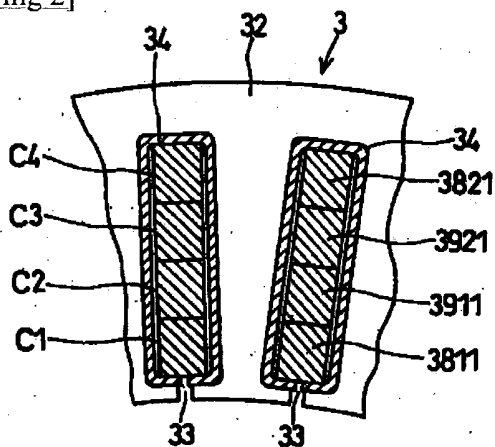
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## DRAWINGS

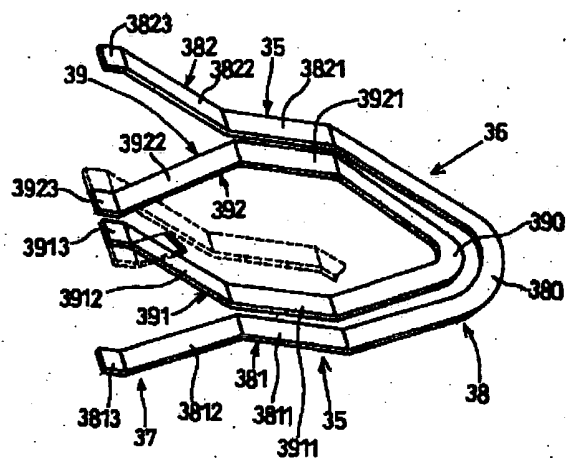
[Drawing 1]



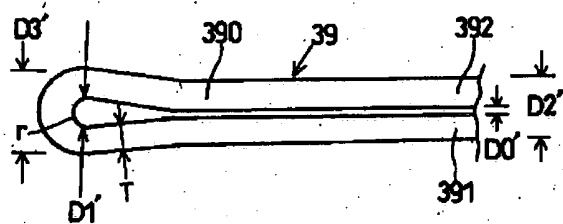
[Drawing 2]



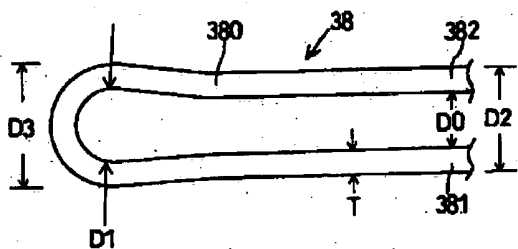
[Drawing 3]



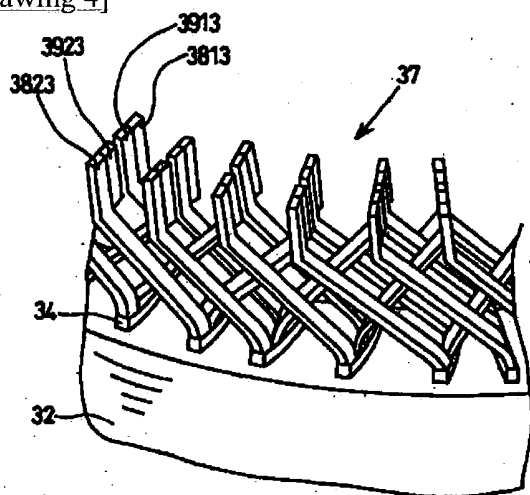
[Drawing 5]



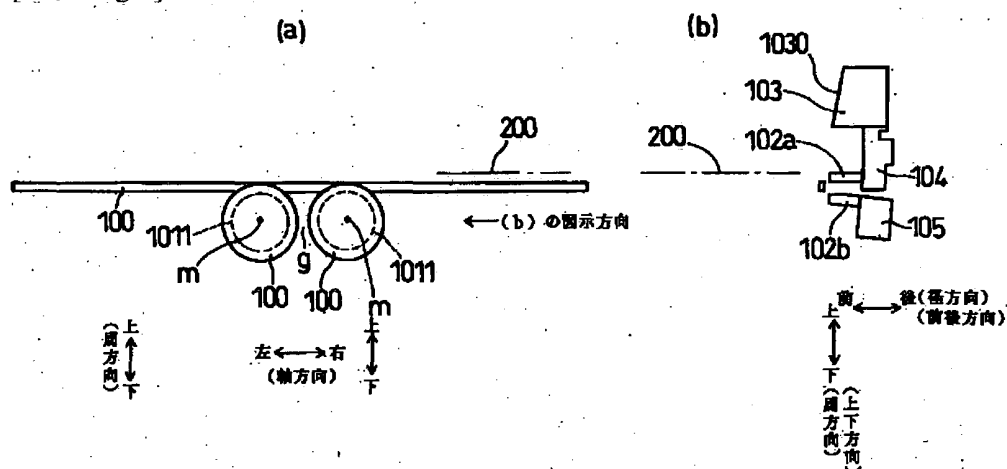
[Drawing 6]



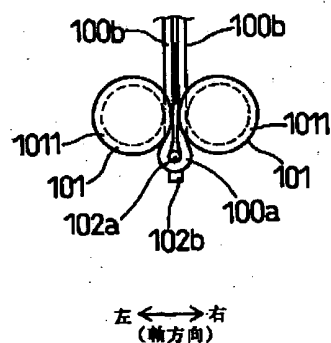
[Drawing 4]



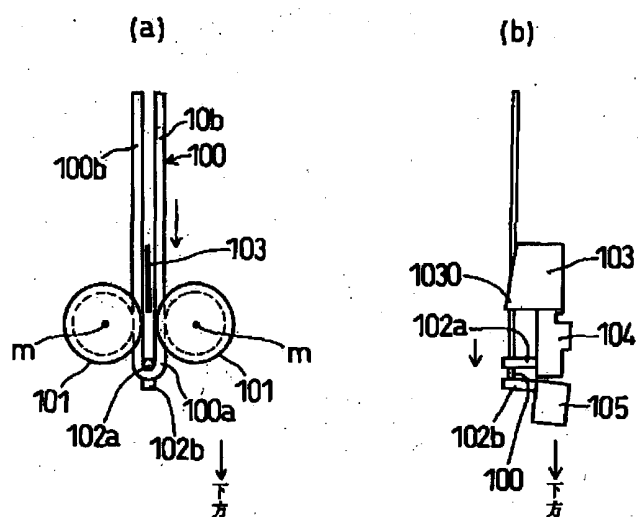
[Drawing 7]



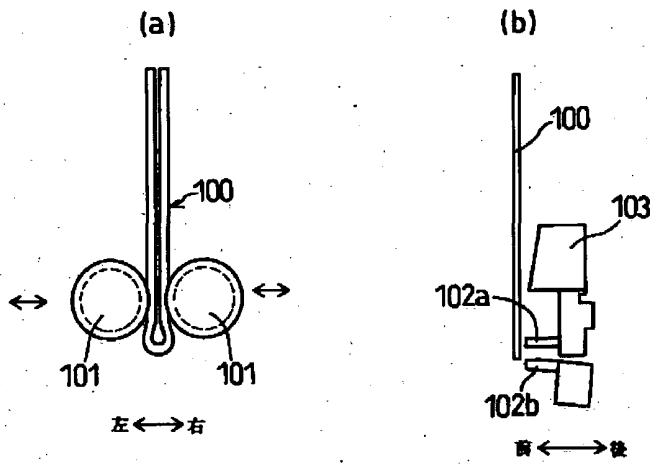
[Drawing 9]



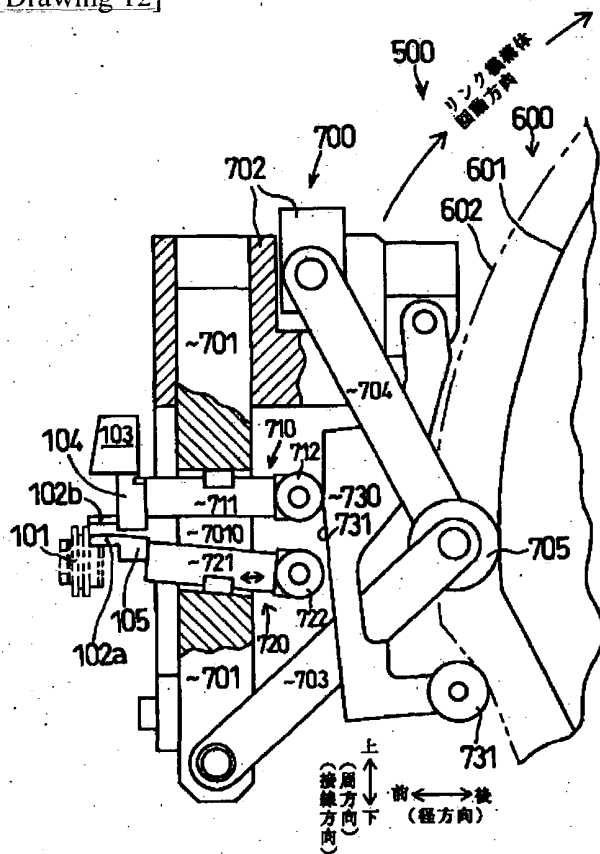
[Drawing 8]



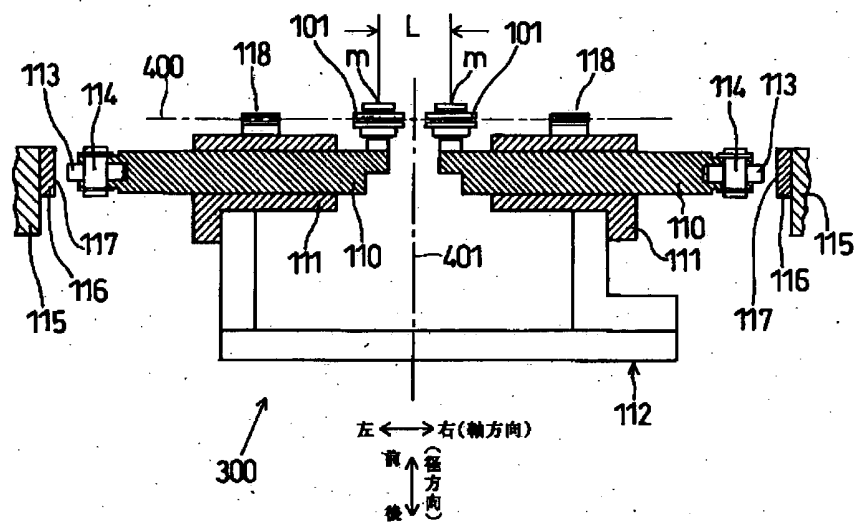
[Drawing 10]



[Drawing 12]



[Drawing 11]



[Translation done.]

## PATENT ABSTRACTS OF JAPAN

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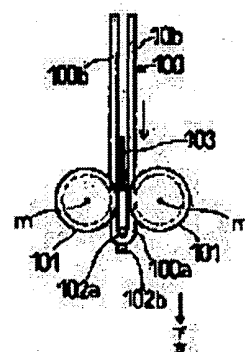
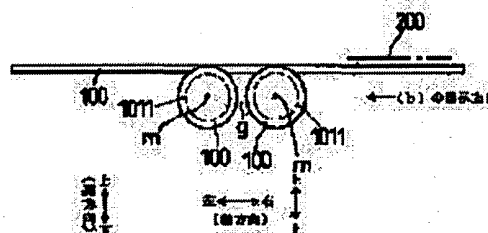
KAMAKURA YOICHI

## (54) MANUFACTURE OF COIL CONDUCTOR FOR ROTARY ELECTRIC MACHINE

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To improve productivity and reduce a bad influence relating to an insulating resin layer, by arranging a conductor wire into contact with an external peripheral surface of a pair of molded rollers arranged in parallel to the axial center, and pressing in the conductor wire between both the molded rollers by a bending member.

**SOLUTION:** A conductor wire 100 is arranged in contact with an external peripheral surface of a pair of molded rollers 101, 101 arranged in parallel to the axial center (m), by pressing in the conductor wire 100 between both the molded rollers 101, 101 by a bending member 102, a needle-shaped conductor is manufactured by bending the conductor wire 100. The molded roller 101, turned in the case of pressing in the conductor wire 100 in a gap (g) between both the molded rollers 101, 101 by the bending member 102, a reduces friction between the conductor wire 100 and the molded roller 101. Bending resistance is reduced, also stress given to an insulating resin layer of the conductor wire 100 by sliding between the conductor wire and the molded roller 101 is relaxed. In this way, a head can be formed without extremely deviating to one side of both legs from an extension line thereof, a process can be simplified.



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**LEGAL STATUS**

[Date of request for examination]

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[Patent number]

[Date of registration]

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[Date of requesting appeal against examiner's decision of rejection]

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 CLAIMS
 

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## [Claim(s)]

[Claim 1] the pine which consists of the leg of the couple which has a predetermined gap mutually from the ends of a U character-like head and the aforementioned head, and extends in this direction -- foliaceous -- the pine which produces many conductors -- foliaceous -- a conductor -- a production process -- and each aforementioned pine -- foliaceous, after inserting in the slot from which the stator core of the couple of a conductor differs each aforementioned pine -- foliaceous -- the point of the leg of a conductor -- every [ a couple ] -- joining -- a coil -- the coil which forms a conductor -- a conductor -- the coil with a formation process of rotation electrical machinery -- the manufacture method of a conductor -- setting -- the aforementioned pine -- foliaceous -- a conductor -- a production process the posture which touches the peripheral face of the forming roller of the couple arranged in axial center parallel -- the aforementioned axial center and an abbreviation right angle -- the conductor of predetermined length -- the conductor which arranges a line -- a line arrangement process -- and a bending member -- the above -- a conductor -- the above from the anti-fabrication roller side of a line -- a conductor -- by making the gap between both the aforementioned fabrication rollers cross, pushing against a line the above -- a conductor -- a line -- bending -- the aforementioned pine -- foliaceous -- the conductor which forms the head of the shape of U aforementioned character of a conductor, and the leg of the aforementioned couple -- the coil of the rotation electrical machinery characterized by having a line bending process -- the manufacture method of a conductor

[Claim 2] the coil of rotation electrical machinery according to claim 1 -- the manufacture method of a conductor -- setting -- the above -- a conductor -- or it laps with a line bending process -- or the above -- a conductor -- the coil of the rotation electrical machinery characterized by to have the distance reduction process between pairs which is made to move both the aforementioned fabrication roller in the aforementioned gap reduction direction, and reduces the width of face between the aforementioned bipped sections after a line bending process -- the manufacture method of a conductor

[Claim 3] In the manufacture method of a conductor the coil of rotation electrical machinery according to claim 2 -- the aforementioned distance reduction process between pairs The width of face of the aforementioned gap direction of the aforementioned leg is narrow-turned rather than the width of face of the aforementioned gap direction of the aforementioned head by carrying out the constriction of the joint of the aforementioned head of a conductor, and the aforementioned leg. the aforementioned pine -- foliaceous -- the pine of the configuration out of which the head stretched and came to the both sides of the aforementioned leg -- foliaceous -- the coil of the rotation electrical machinery characterized by being what produces a conductor -- the manufacture method of a conductor

[Claim 4] a claim 1 or either of 3 -- the coil of the rotation electrical machinery of a publication -- the manufacture method of a conductor -- setting -- the above -- a conductor -- a line bending process -- the aforementioned bending member -- the above -- a conductor -- the coil of the rotation electrical machinery characterized by the thing which sandwich a line, and which you makes cross the gap between both the aforementioned fabrication rollers with the aforementioned bending member, bending too much, preparing a prevention member and making predetermined distance hold the aforementioned

bending

[Claim 5] a claim 2 or either of 4 -- the coil of the rotation electrical machinery of a publication -- the manufacture method of a conductor -- setting -- the above -- a conductor -- the coil of the rotation electrical machinery which a line bending process is in the state whose interposition member for securing the gap of predetermined width of face was pinched between the aforementioned legs, and is characterized by to make the gap between both the aforementioned fabrication rollers cross the aforementioned bending member -- the manufacture method of a conductor

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention -- a pine -- foliaceous -- a conductor -- it is related with the rotation electrical machinery which has a sequential connection type stator coil

[0002] a pine -- foliaceous -- a conductor -- the rotation electrical machinery which has a sequential connection type stator coil is known

[0003] the pine in which the stator coil of this rotation electrical machinery has a U character-like head and the leg of the couple which extends from the ends of this head -- foliaceous -- a conductor -- a large number -- preparing -- each pine -- foliaceous -- after inserting the biped section of a conductor in the slot from which a stator core differs, the point of each leg is connected one by one, and it is formed moreover, a pine -- foliaceous -- a conductor has the configuration where both the end faces of the leg of a couple were connected in the curved head, respectively, and is covered with the insulating resin layer

[0004] this kind of pine -- foliaceous -- there is technology of JP,2-32873,A as production equipment of a conductor

[0005] A crevice type member with the cross-section configuration which is in agreement with the crevice in the head of a conductor is prepared. according to this technology -- the core of a rotation disk -- a pine -- foliaceous -- A line is deformed plastically and forced on the periphery of the above-mentioned crevice type member. the path outside of this crevice type member -- a straight-line-like conductor -- the line has been arranged and it protruded on the rotation disk by rotating the above-mentioned rotation disk -- hooking -- a salient -- a conductor -- the state where it hooked on the line -- this hook salient -- predetermined angle rotation -- carrying out -- a conductor -- the conductor at which it turned at the end -- a line -- drawing out -- a pine -- foliaceous -- the conductor is produced

[0006]

[Problem(s) to be Solved by the Invention] however, the above-mentioned conventional pine -- foliaceous -- a conductor -- according to production technology -- a principle top and a pine -- foliaceous -- the head of a conductor -- one leg side -- large -- music, although formed since this head is a coil and a portion -- a pine -- foliaceous -- since it was not desirable, it had to remold the head by later that the head of a conductor bends greatly to one leg side according to the shape of coil endo form, and it had the problem of being inferior to productivity moreover -- such -- repeatedly -- a conductor -- bending a line - a conductor -- there was a problem of having a bad influence on the insulating resin layer of a line

[0007] the coil of rotation electrical machinery with few bad influences [ as opposed to / this invention made in view of the above-mentioned trouble, excel in productivity, and / an insulating resin layer ] -- it sets it as the purpose to offer the manufacture method of a conductor

[0008]

[Means for Solving the Problem] the coil of the rotation electrical machinery according to claim 1 made in order to solve the above-mentioned technical problem -- according to the manufacture method of a conductor -- a conductor -- the peripheral face of the forming roller of the couple arranged in axial center parallel in the line -- touching -- arranging -- a bending member -- a conductor -- pushing in a line

between both fabrication rollers -- a conductor -- a line -- bending -- a pine -- foliaceous -- a conductor is produced a forming roller -- a bending member -- a conductor -- the time of stuffing a line into the gap between both fabrication rollers -- rotating -- a conductor -- while reducing friction between a line and a forming roller and reducing flexing resistance -- a conductor -- sliding between a line and a forming roller -- a conductor -- the stress given to the insulating resin layer of a line is eased

[0009] without according to this composition it can form a head, without inclining toward the one side of the biped section greatly from the extension wire top of the biped section and remolds this head -- a coil -- and -- since it can be alike and can use, a process is simple -- becoming -- a conductor -- the bad influence to the insulating resin layer of a line can also be stopped to the minimum moreover -- this composition -- bending -- promotion of a member -- two forming rollers -- a conductor -- since a line is bent -- a conductor -- a line can essentially shorten a cycle time as compared with the case where it can be simultaneously bent and fabricated in two places, and fabricates by bending by one by the above-mentioned conventional technology, and can improve productivity

[0010] according to composition according to claim 2 -- the coil of rotation electrical machinery according to claim 1 -- the manufacture method of a conductor -- setting -- further -- a conductor -- or it laps with a line bending process -- or a conductor -- since both the fabrication roller is moved in the gap reduction direction and the width of face between the biped sections is reduced after a line bending process -- the narrow gap between the forming rollers of a couple -- impossible -- a conductor -- a line -- pushing -- it is not necessary to put in -- the few force -- smooth -- a

[0011] according to composition according to claim 3 -- the coil of rotation electrical machinery according to claim 2 -- the configuration out of which the head stretched and came to the both sides of the leg further in the manufacture method of a conductor -- a pine -- foliaceous -- since a conductor is produced, the curvature of a head can be enlarged, the bending stress of the insulating resin layer of a head can be mitigated, and generating of the tear can be inhibited in addition -- the former -- a pine -- foliaceous -- the overall diameter direction gap length in the head of a conductor was set up equally to it between the biped sections

[0012] according to composition according to claim 4 -- a claim 1 or either of 3 -- the coil of the rotation electrical machinery of a publication -- the manufacture method of a conductor -- setting -- further -- a bending member -- a conductor -- a line is inserted -- it bends too much, a prevention member is prepared and it bends too much, and a prevention member is bent, making predetermined distance hold to a bending member, and the gap between both fabrication rollers is made to cross with a member

[0013] thus, the time of stuffing a bending member into the above-mentioned gap, if it carries out -- a conductor -- it does not become the configuration where bent too much and it sharpened so that the bending point of a line may be crooked, but it can prevent that the insulating resin layer on the front face of an outside of this bending point is torn namely, -- bending -- passing -- prevention -- since a head nose of cam can curve round because of the existence of a member, the tear of an insulating resin layer can be prevented

[0014] according to composition according to claim 5 -- a claim 2 or either of 4 -- the coil of the rotation electrical machinery of a publication -- further the interposition member for securing the gap of predetermined width of face in the state where it inserted between the legs, in the manufacture method of a conductor It can prevent turning at a bending member too much in the direction in which the biped section approaches mutually, since the gap between both the aforementioned fabrication rollers is made to cross, and an interval suitable between the biped sections can be secured.

[0015]

[Embodiments of the Invention] the coil of the rotation electrical machinery of this invention -- the suitable mode of the manufacture method of a conductor is explained below based on an example

[0016]

[Example] (Pine foliaceous explanation of the AC generator for vehicles using the conductor) the coil of the rotation electrical machinery of this invention -- the AC generator for vehicles using a conductor is explained with reference to drawing 1 - drawing 6 the pine of the couple from which drawing 2 shows only a part for two slots for the direction cross section of a path of a stator 3, and drawing 3 constitutes a

stator winding 31 -- foliaceous -- the \*\* type perspective diagram of conductors 38 and 39 is shown [0017] A stator 3 is formed in the periphery side of a field core 7, and is equipped with a stator winding (stator coil) 31 and a stator core 32.

[0018] The stator core 32 has many slots 33 for holding the stator winding 31 of a polyphase. 34 is an insulator which carries out electric insulation of between a stator core 32 and stator windings 31 within a slot 33. With this operation gestalt, in order to hold the stator winding of the three phase circuit corresponding to the number of magnetic poles of a rotator 2, 96 slots 33 are formed at equal intervals. each slot 33 -- even (this examples -- the slot of 4) -- a conductor -- the section hold positions C1, C2, C3, and C4 are established in the path outside in order from the path inside

[0019] the slot by which a stator winding 31 is held in a slot 33 -- a conductor -- the section 35 and a slot -- a conductor -- the 1st projecting coil which is extended from the section 35 to a rear side slot outside and 36, and a slot -- a conductor -- from the 2nd coil which projects in the front side besides a slot from the section 35, and 37 -- becoming -- respectively -- a square shape -- the pine of the shape of a circumference of a large of a large number which are conductors -- foliaceous --

[0020] a circumference of large-like pine -- foliaceous -- a conductor 38 consists of a head 380 of the letter of the abbreviation for U characters which constitutes the 1st coil and 36, and the legs 381 and 382 of the couple which extends from the ends of a head 380, as shown in drawing 3 The head 890 has the hoop-direction span of a predetermined pole pitch in the joint with the legs 381 and 382.

[0021] the leg 381 -- the slot of a slot 33 -- a conductor -- the slot held in an insertion point C1 -- a conductor -- the section 3811 and a slot -- a conductor -- it consists of a nose-of-cam side lobe 3812 which projects from the section 3811 to a front side, and constitutes the 2nd coil and 37, and the nose-of-cam side lobe 3812 has a joint 3813 at the nose of cam

[0022] the leg 382 -- the slot of a slot 33 -- a conductor -- the slot held in an insertion point C4 -- a conductor -- the section 3821 and a slot -- a conductor -- it consists of a nose-of-cam side lobe 3822 which projects from the section 3821 to a front side, and constitutes the 2nd coil and 37, and the nose-of-cam side lobe 3822 has a joint 3823 at the nose of cam

[0023] It is separated [ from the end face (slot a conductor section side) of the nose-of-cam side lobe 3812, the nose of cam, and the end face (slot the conductor section side) and nose of cam of the nose-of-cam side lobe 3822 ] of the distance of the abbreviation half of the hoop-direction span of a head 380 to the hoop direction.

[0024] the pine of the letter of a small turn -- foliaceous -- a conductor 39 consists of a head 390 of the letter of the abbreviation for U characters which constitutes the 1st coil and 36, and the legs 391 and 392 of the couple which extends from the ends of a head 390, as shown in drawing 3 The head 390 has the hoop-direction span of a predetermined pole pitch in the joint with the legs 391 and 392.

[0025] the leg 391 -- the slot of a slot 33 -- a conductor -- the slot held in an insertion point C2 -- a conductor -- the section 3911 and a slot -- a conductor -- it consists of a nose-of-cam side lobe 3912 which projects from the section 3911 to a front side, and constitutes the 2nd coil and 37, and the nose-of-cam side lobe 3912 has a joint 3913 at the nose of cam

[0026] the leg 392 -- the slot of a slot 33 -- a conductor -- the slot held in an insertion point C3 -- a conductor -- the section 3921 and a slot -- a conductor -- it consists of a nose-of-cam side lobe 3922 which projects from the section 3921 to a front side, and constitutes the 2nd coil and 37, and the nose-of-cam side lobe 3922 has a joint 3923 at the nose of cam

[0027] It is separated [ from the end face (slot a conductor section side) of the nose-of-cam side lobe 3912, the nose of cam, and the end face (slot the conductor section side) and nose of cam of 3922 ] of the distance of the abbreviation half of the hoop-direction span of a head 390 to the hoop direction.

[0028] the pine of the shape of same circumference of a large -- foliaceous -- the legs 381 and 382 of the couple of a conductor 38 -- further -- detailed -- those slots -- a conductor -- a pole pitch remote predetermined in the sections 3811 and 3821 -- it holds in a mutually different slot 33 separately the of the letter of a small turn -- foliaceous -- the legs 391 and 392 of the couple of a conductor 39 -- further -- detailed -- those slots -- a conductor -- a pole pitch remote predetermined in the sections 3911 and 3921 -- it holds in a mutually different slot 33 separately

[0029] it already explained -- as -- a circumference of large-like pine -- foliaceous -- the slot of the leg 381 of a conductor 38 -- a conductor -- the section 3811 -- the shallowest slot of a slot 33 -- a conductor -- it holds in an insertion point C1 -- having -- a circumference of large-like pine -- foliaceous -- the slot of the leg 382 of a conductor 38 -- a conductor -- a slot with the deepest section 3821 -- a conductor -- it holds in the insertion point C4

[0030] the same -- the pine of the letter of a small turn -- foliaceous -- the slot of the leg 391 of a conductor 39 -- a conductor -- a slot with the section 3911 shallow to the second of a slot 33 -- a conductor -- it holds in an insertion point C2 -- having -- the pine of the letter of a small turn -- foliaceous -- the slot of the leg 392 of a conductor 39 -- a conductor -- a slot with the section 3921 shallow to the third -- a conductor -- it holds in the insertion point

[0031] thereby -- the 1st coil of a rear side, and 36 -- setting -- a circumference of large-like pine -- foliaceous -- the head 380 of a conductor 38 -- the pine of the letter of a small turn -- foliaceous -- it can arrange so that the head 390 of a conductor 39 may be wrapped, and it is prevented that both the heads 380 and 390 cross and interfere

[0032] furthermore -- if it explains -- the 1st coil of a rear side, and 36 -- setting -- a head 380 -- a slot -- a conductor -- the slot of the leg 381 inserted in an insertion point C1 -- a conductor -- the section 3811 and a slot -- a conductor -- the slot of the leg 382 inserted in an insertion point C4 -- a conductor -- the section 3821 is connected moreover, the head 390 -- a slot -- a conductor -- the slot of the leg 391 inserted in an insertion point C2 -- a conductor -- the section 3911 and a slot -- a conductor -- the slot of the leg 392 inserted in an insertion point C3 -- a conductor -- the section 3921 is connected

[0033] the 2nd coil by the side of a front and 37 -- setting -- the pine of C1 position -- foliaceous -- the pine of C2 position where the nose-of-cam side lobe 3812 of the leg 381 of a conductor 38 adjoins in the direction of a path in the nose of cam -- foliaceous -- it is joined to the nose-of-cam side lobe 3912 of the leg 391 of a conductor 39 [ moreover, ] the same -- the pine of C4 position -- foliaceous -- the pine of C3 position where the nose-of-cam side lobe 3822 of the leg 382 of a conductor 38 adjoins in the direction of a path in the nose of cam -- foliaceous -- it is joined to the nose-of-cam side lobe 3922 of the leg 392 of a conductor 39

[0034] namely, a slot -- a conductor -- the slot of the leg 381 inserted in an insertion point C1 -- a conductor -- the section 3811 -- the 2nd coil by the side of a front, and 37 -- setting -- a slot -- a conductor -- the slot of the leg 391 inserted in an insertion point C2 -- a conductor -- it connects with the section 3911 moreover, a slot -- a conductor -- the slot of the leg 382 inserted in an insertion point C4 -- a conductor -- the section 3821 -- the 2nd coil by the side of a front, and 37 -- setting -- a slot -- a conductor -- the slot of the leg 392 inserted in an insertion point C3 -- a conductor -- it connects with the section 3921 Thereby, the stator winding 31 of a three phase is formed. The 2nd coil by the side of a front and a part of 37 are shown in drawing 4.

[0035] however, the slot which constitutes the leader line of a stator winding 31 -- a conductor -- the section -- and -- and some slots -- a conductor -- the section -- these pines -- foliaceous -- it is formed in a configuration which is different in conductors 38 and 39 namely, -- the 1st coil of rear \*\*, and 36 -- a slot -- a conductor -- the slot of insertion points C1 and C4 -- a conductor -- the section and a slot -- a conductor -- the slot of insertion points C2 and C3 -- a conductor -- a special pine with the variant head which connects the section -- foliaceous -- a conductor is prepared

[0036] this kind of pine -- foliaceous -- a conductor -- the method various to the composition of a three phase stator coil in addition which omits the further explanation since the structure itself and the wiring form itself of a stator coil of a sequential connection form are the same as the above-mentioned conventional technology -- it is -- the above-mentioned pine -- foliaceous -- a conductor -- naturally it is possible to give various variations to connection of the stator coil of a sequential connection form Thus, a stator winding 31 is formed.

(Explanation of the manufacturing process of a stator winding 31) The manufacturing process of a stator winding 31 is explained below.

[0037] - a pine -- foliaceous -- the square shape covered with manufacture \*\*\*\* of a conductor, and the insulating resin layer -- a conductor -- after cutting a line to predetermined length and exfoliating the

insulating resin layer of both ends -- respectively -- bending -- a pine -- foliaceous -- produce conductors 38 and 39 the pine of the letter of a small turn -- foliaceous -- an about 390 head [ of a conductor 39 ] partial side elevation -- drawing 5 -- being shown -- a circumference of large-like pine -- foliaceous -- an about 380 head [ of a conductor 38 ] partial side elevation is shown in drawing 6

[0038] a circumference of large-like pine -- foliaceous -- a pine [ in / the same direction as this gap width of face / in the gap width of face D0 between the legs 381 and 382 of a conductor 38 ] -- foliaceous -- it is made smaller than the maximum gap width of face D1 of the head 380 of a conductor 38 therefore, the direction of the above-mentioned gap width of face D0 -- setting -- a pine -- foliaceous -- the whole leg 381 and 382 width of face D2 of a conductor 38 -- about  $D - 0 + 2T$  -- becoming -- a pine -- foliaceous -- the whole head 380 width of face D3 of a conductor 38 -- about  $D$  -- it is set to  $1 + 2T$  and has become  $D3 > D2$  T -- a pine -- foliaceous -- it is the thickness in the direction of the gap width of face D0 of a conductor 38

[0039] the same -- the pine of the letter of a small turn -- foliaceous -- a pine [ in / the same direction as this gap width of face / in gap width-of-face D0' between the legs 391 and 392 of a conductor 39 ] -- foliaceous -- it is made smaller than maximum gap width-of-face D1' of the head 390 of a conductor 39 therefore, the direction of above-mentioned gap width-of-face D0' -- setting -- a pine -- foliaceous -- whole leg 391 and 392 width-of-face D2' of a conductor 39 -- about  $D - 0' + 2T$  -- becoming -- a pine -- foliaceous -- whole head 390 width-of-face D3' of a conductor 39 -- about  $D - 1' + 2T$  -- becoming --  $D3$  -- it is ' $>D2'$  T -- a pine -- foliaceous -- it is the thickness in the direction of gap width-of-face D0' of a conductor 39 in addition, two adjoining slots [ gap width-of-face D0' is almost set to 0 in fact, and / T ] in a slot 33 -- a conductor -- it considers as the value slightly smaller than the width of face between insertion points

[0040] in addition -- this stage -- a pine -- foliaceous -- the case where the legs 381 and 382 of the couple of a conductor 38 are projected in the gap width-of-face D0 direction -- lapping -- \*\*\*\* -- a pine -- foliaceous -- the legs 391 and 392 of the couple of a conductor 39 have lapped, when it projects in the direction of gap width-of-face D0'

[0041] next, a pine -- foliaceous -- the legs 381 and 382 of the couple of a conductor 38 have a predetermined hoop-direction span -- as -- a reference point [ center / of a head 380 ] -- carrying out -- a hoop direction -- opening -- the same -- a pine -- foliaceous -- it opens to a hoop direction on the basis of the center of a head 390 so that the legs 391 and 392 of the couple of a conductor 39 may have a predetermined hoop-direction span

[0042] in addition, this time -- a pine -- foliaceous -- with half one which goes to the leg 381 of the path inside from the center section of the head 380 of a conductor 38 a pine -- foliaceous -- in other halves one which go to the leg 381 of the path inside from the center section of the head 380 of a conductor 38 Since the direction position of a path of the leg 381 is smaller than the direction position of a path of the leg 382 When opening to a hoop direction by halves of the above-mentioned hoop-direction span, respectively, the hoop-direction distance of half one which goes to the leg 381 of the above-mentioned path inside among heads 380 becomes shorter than the hoop-direction distance of half one which goes to the leg 382 of the above-mentioned path outside. Therefore, in order to secure this distance difference, when half one which goes to the leg 381 of the above-mentioned path inside among heads 380 swells to the path inside, half one which goes to the leg 382 of the above-mentioned path outside consumes the swelling to the original path outside. Consequently, the swelling to the path outside of half one which goes to the leg 382 of a path outside among heads 380 will decrease relatively. The swelling to the path outside of half one which is the same also in a head 390 as for this, and goes to the leg 392 of the path outside will decrease relatively. Of course, in consideration of the above-mentioned hoop-direction distance difference, you may enlarge beforehand relatively the swelling to the path outside of half one which goes to the leg 382 of a path outside among heads 380 rather than the swelling inside [ path ] half one which goes to the leg 381 of the path inside. Similarly, in consideration of the above-mentioned hoop-direction distance difference, you may enlarge beforehand relatively the swelling to the path outside of half one which goes to the leg 392 of a path outside among heads 390 rather than the swelling inside [ path ] half one which goes to the leg 391 of the path inside.

[0043] - a pine -- foliaceous -- insertion into the slot 33 of conductors 38 and 39, next a pine -- foliaceous -- the legs 391 and 392 of a conductor 39 -- mutual -- a hoop direction -- a predetermined pole pitch -- \*\*\*\*\* -- the slot 33 of a couple -- individual -- inserting in -- the same -- a pine -- foliaceous -- the legs 381 and 382 of a conductor 38 -- mutual -- a hoop direction -- a predetermined pole pitch -- \*\*\*\*\* -- insert in the slot 33 of a couple individually

[0044] - a pine -- foliaceous -- bending, next the pine of the nose-of-cam side lobe of conductors 38 and 39 -- foliaceous -- the front side from the slot 33 of the legs 381 and 382 of a conductor 38 -- a protrusion -- the nose-of-cam side lobes 3812 and 3822 which are portions the bottom -- a hoop direction -- predetermined pitch bending -- the same -- a pine -- foliaceous -- the front side from the slot 33 of the legs 391 and 392 of a conductor 39 -- a protrusion -- the nose-of-cam side lobes 3912 and

[0045] Thereby, the nose of cam of the nose-of-cam side lobe 3912 is made to adjoin at the nose of cam of the nose-of-cam side lobe 3812 in the direction of a path, and the nose of cam of the nose-of-cam side lobe 3922 is made to adjoin at the nose of cam of the nose-of-cam side lobe 3822 in the direction of a path.

[0046] Next, the nose-of-cam joint 3923 of the nose-of-cam side lobe 3922 and the nose-of-cam joint 3823 of the nose-of-cam side lobe 3822 are welded to the nose-of-cam joint 3813 of the nose-of-cam joint 3913 of the nose-of-cam side lobe 3912, and the nose-of-cam side lobe 3812, and a row, respectively (refer to drawing 4 ). This forms a stator 3.

[0047] In the stator winding 31 constituted by the above-mentioned manufacture method, after the field by the side of the bore of the outside head 380 comes out of a slot 33, it is \*\*\*\*(ed) by the peripheral face of the periphery shoulder 75 of this taper configuration in the path inside at abbreviation parallel. Thereby, if it says further, the 1st coil and 36, and the radius of curvature in the direction of a path of heads 380 and 390 can be set up greatly, the stress of the 1st coil and the insulating resin layer in 36 can be mitigated, and the tear can be inhibited good.

(Pine foliaceous explanation of the manufacturing process of conductors 38 and 39) the pine which makes the feature of this invention hereafter and which was mentioned above -- foliaceous -- the manufacturing process of a conductor is explained in more detail using drawing 7 - drawing 12

[0048] first, the pine which makes the important section of this example using drawing 7 - drawing 10 -- foliaceous -- a conductor -- a production process is explained and the composition of the bending equipment which carries out the above-mentioned bending process using drawing 11 - drawing 12 is explained

[0049] (Conductor line arrangement process) drawing 7 -- using -- a conductor -- the installation process to the forming roller top of a line is explained bending [ in / the direction of a path of the above-mentioned bending equipment / drawing 7 (a) shows the front view of the forming roller in the shaft orientations of the bending equipment mentioned later, and / in drawing 7 (b) ] -- a member 101 -- bending -- passing -- prevention -- a member 102 and interposition -- the side elevation showing a member 103 is shown

[0050] 100 -- insulating resin layer covering of the shape of a straight line of predetermined length -- a conductor -- it is the straight angle line which consists of a line, and the minimum cross section of the straight angle line 100 is a rectangle, and has exfoliated the insulating resin layer of both ends

[0051] Two forming rollers 101 and 101 are arranged free [ rotation ] around the axial center m extended to a space perpendicular direction among drawing 7 , and the axial center m of both the fabrication roller 101 separates the predetermined gap g, and is parallel. a circular sulcus 1011 prepares one articles in the peripheral face of both the fabrication roller 101, respectively -- having -- \*\*\*\* -- drawing 7 (a) -- both the circular sulci 1011 -- one conductor -- the line 100 is laid

[0052] bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- although illustration of a member 103 is omitted in drawing 7 (a) -- drawing 7 (a) -- setting -- these bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- the member 103 is arranged up and down behind the straight angle line 100 along the mid-position between both the axial centers m and m in the longitudinal direction

[0053] bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition --



a member 103 is shown in drawing 7 (b) -- as -- the lower part from the upper part -- bending -- passing -- prevention -- member 102b and bending -- member 102a and interposition -- it is arranged in order of the member 103, and is arranged in drawing 7 (b) just behind both the fabrication roller 101 that carried out the illustration ellipsis In addition, also in drawing 7 (b), although the straight angle line 100 is laid in the circular slot 1011 of both the fabrication roller 101, illustration of both the fabrication roller 101 is omitted in drawing 7 (b).

[0054] bending -- a member -- 102a consists of the round bar which projects from the front end side lower part of the connection board 104 to the front in the right above position of the straight angle line 100, and shaft orientations in the vertical direction as shown in drawing 7 (b)

[0055] bending -- passing -- prevention -- a member -- 102b consists of sheet metal which projects from a support plate 105 to the front in the directly under position of the straight angle line 100, and shaft orientations in the vertical direction as shown in drawing 7 (b)

[0056] interposition -- a member 103 is shown in drawing 7 (b) -- as -- the vertical direction from the upper-limit side of the connection board 104 -- setting -- bending -- a member -- from the sheet metal which projects to the front in the upper part position of 102a, and shaft orientations -- becoming -- interposition -- the front end side 1030 of a member 103 goes to the upper part from the lower part -- it is alike, and it follows and inclines back

[0057] The right above position of the periphery edge of both the fabrication roller 101 is sent to back from the front of both the fabrication roller 101, and the straight angle line 100 falls into the circular slot 1011 from the back end of the above-mentioned straight-line feed gear with the straight-line feed gear which is not illustrated in the stopper which is not illustrated right above [ of the circular slot 1011 of both the fabrication roller 101 ].

[0058] On the straight angle line delivery section of this straight-line feed gear, many straight angle lines 100 separate a predetermined interval mutually, and are laid by the cross direction with the posture extended to the longitudinal direction shown in drawing 7 (a), and it is sent to right above [ of the circular slot 1011 ] all at once by driving the straight angle line delivery section of a straight-line feed gear.

[0059] Although various formal peaches' are known as this kind of a straight-line feed gear, in this example, the straight-line feed gear of a screw (delivery screw) formula is suitable. In the straight-line feed gear of this screw (delivery screw) formula, the screw rod (straight angle line delivery section) which is located in the right-and-left both sides of both the fabrication roller 101, for example, and is extended to a cross direction is prepared, and each straight angle line 100 is laid in the trough of the peripheral face of both the screw rod. If synchronous rotation of this screw rod is carried out, each straight angle lines 100 are sent all at once back, and when one straight angle line 100 falls into the circular slot 1011, they will stop rotation of a screw rod. About the composition of the straight-line feed gear itself, and operation, it is common knowledge, and since it is not the important section of this example, either, the explanation beyond this is omitted. In addition, you may set the straight angle line 100 to the circular slot 1011 using a robot etc.

(Pine foliaceous a conductor the conductor of a production process line bending process) The bending process of the straight angle line 100 is explained using drawing 8 . bending [ in / the direction of a path of the above-mentioned bending equipment / drawing 8 (a) shows the front view of the forming roller in the shaft orientations of the bending equipment mentioned later, and / in drawing 8 (b) ] -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- the side elevation in the cross direction of a member 103 is shown

[0060] first, bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- a member 103 -- the front from the position of drawing 7 (b) -- predetermined distance advance -- carrying out -- bending -- member 102a -- bending -- passing -- prevention -- a member -- 102b sandwiches the straight angle line 100 interposition -- the front end section 1030 of a member 103 reaches above the straight angle line 100 in a cross direction

[0061] next, bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- a member 103 carries out predetermined distance movement to a lower part, and,

thereby, the straight angle line 100 is bent by existence of both the fabrication roller 101 in the shape of U character in addition, after this movement in a lower part -- setting -- bending -- a member -- 102a -- the circular slot 1011 -- a lower part -- being located -- interposition -- it is made for a member 103 to be located more nearly up than the axial center of both the fabrication roller 101 thereby, head 100a of the straight angle line 100 and leg 100b of the couple of the straight angle line 100 form -- having -- biped section 100b -- interposition -- the front end section 1030 of a member 103 is inserted

[0062] the above-mentioned bending -- a member -- the time of bending of the straight angle line 100 by 102a -- bending -- passing -- prevention -- a member -- in contact with the soffit of the straight angle line 100, the soffit of the straight angle line 100 bends too much, and sharpens, and 102b prevents that an insulating resin layer is torn by this

(Pine foliaceous a conductor distance reduction process between pairs of a production process) The distance reduction process between forming roller pairs of the straight angle line 100 is explained using drawing 9 . Drawing 9 shows the front view of the forming roller 101 in the shaft orientations of the bending equipment mentioned later.

[0063] a conductor -- after a line bending process end and both the fabrication roller 101 -- a longitudinal direction -- it is made to move to the sense which approaches mutually, respectively, and the right-and-left width of face of the portion between head 100a and leg 100b of a couple (henceforth a neck) is made to reduce to it this time -- interposition -- the front end section 1030 of a member 103 exists as a spacer between leg 1100b of a couple, and secures a gap required among leg 100b of a couple

[0064] In addition, in this example, since the right-and-left width of face of head 100a is formed of this distance reduction process between pairs more greatly than the right-and-left width of face between leg 100b of a couple, consequently the radius of curvature of head 100a can be greatly set up so that it may illustrate, the stress of the insulating resin layer in head 100a can be reduced.

(Withdrawal process) A withdrawal process is explained using drawing 10 . the front view of the forming roller 101 in the shaft orientations of the bending equipment which drawing 10 (a) mentions later -- being shown -- drawing 10 (b) -- bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- the side elevation in the cross direction of a member 103 is shown

[0065] first -- both the fabrication roller 101 -- a longitudinal direction -- it moves to the sense which keeps away mutually, respectively -- making -- next, bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- the straight angle line 100, i.e., a pine, which the member 103 was retreated back, bent by this, and was fabricated -- foliaceous -- it secedes from equipment from a conductor -- making -- a pine -- foliaceous -- the production process of a conductor is ended

(Forming roller move mechanism 300)

(Composition) The forming roller move mechanism 300 in which the distance L between pairs between both the axial centers m of both the fabrication roller 101 in the distance reduction process between forming roller pairs mentioned above is changed is explained below with reference to drawing 11 . in addition, drawing 11 -- setting -- an alternate long and short dash line 401 -- bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- the center position in the longitudinal direction of a member 103 is shown, and an alternate long and short dash line 400 shows the installation position of the straight angle line 100 on both the fabrication roller 101

[0066] Both the fabrication roller 101 is supported by the point of both the rods 110 with which the axial center has been arranged on the same straight line free [ rotation ] to a longitudinal direction, respectively, and both the rods 110 are held free [ longitudinal-direction movement ] individually at the cylinder 111 of a couple. The cylinder 111 is being fixed to the below-mentioned link mechanism object 700 through the support frame 112, and this link mechanism object 700 moves the periphery of the below-mentioned cam drum (not shown) which makes an alternate long and short dash line 401 the direction of a path, has an axial center parallel to an alternate long and short dash line 400, and has the below-mentioned cam side (not shown) on a periphery to a hoop direction.

[0067] The cam follower 113 is individually supported by the end face of both the rods 110 free

[ rotation ]. The shaft 114 of a cam follower 113 is parallel to an alternate long and short dash line 300. [0068] It is located in the longitudinal-direction outside of both the cam followers 113 at the shaft-orientations both sides of the above-mentioned cam drum, and the cam side bearing object 115 of the shape of a ring of a couple is fixed individually, and the cam 116 of a ring tabular is formed in the end face which faces the cam follower 113 of the cam side bearing object 115, respectively. 117 is the cam side of a cam 116, and 118 is the stopper fixed to the cylinder 111, and the straight angle line 100 sent by the straight-line feed gear (not shown) mentioned above has movement to the feed direction beyond it regulated by this stopper 118 from the nose of cam of this straight-line feed gear, falls on a stopper 118, and is laid on a stopper 118 and the forming roller 101.

[0069] (Operation) In the position on the periphery of the aforementioned cam drum which does not need reduction of the distance L between forming roller pairs of both the fabrication roller 101 Although both the cam followers 113 are distant from the cam side 117, both the rods 110 are energized in the direction mutually left with the spring which is not illustrated and the distance L between forming roller pairs is expanded Regulated with a non-illustrated stopper by both the rods 110 so that the distance from the alternate long and short dash line 401 to the axial center m of the forming roller 101 may not exceed a predetermined value, thereby, the distance L between forming roller pairs is a predetermined large distance.

[0070] In operation which reduces the width of face between the biped sections of the straight angle line 100 by reduction of the distance L between forming roller pairs of both the fabrication roller 101, the cam side 117 resists the above-mentioned spring, a rod 110 is pushed, the forming roller 101 is pushed, and it is performed.

(Bending move mechanisms 500, such as a member) it mentioned above -- bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- bending which a member 103 is made to move to a cross direction, and is moved in the vertical direction -- the move mechanisms 500, such as a member, are explained below with reference to drawing 12 The cam drum of the above-mentioned [ 600 ] and 700 are link mechanism objects which rotate along with the periphery of this cam drum 500. However, at drawing 12 , the convenience top of space and a cam drum 600 are the part (only the position which lays the straight angle line 100 on both the fabrication roller 101 shall be illustrated). Moreover, in order to make an understanding easy, illustration is omitted about the forming roller move mechanism 300 mentioned above. Therefore, the cross direction explained until now corresponds in the direction of a path of this cam drum 600, a longitudinal direction is equivalent to the shaft orientations of this cam drum 600, and the vertical direction is equivalent to the abbreviation hoop direction (correctly tangential direction) of this cam drum 600.

[0071] 701 is a slider and the point of a slider 701 is inserted free [ vertical directional movement ] in the guide slot 703 of the slider electrode holder 702. The slider 701 is energized upwards among drawing 12 with the spring which is not illustrated.

[0072] The end face section of a slider 701 is connected with the electrode holder 702 through links 703 and 704. A cam follower 705 is formed in the connection section of links 703 and 704, and the cam follower 705 is forced with the spring which is not illustrated to the cam side 601 of a cam drum 600.

[0073] the above-mentioned bending fixed to the cam follower 712 prepared in the end face of the plate 711 which the connection board mechanical component 710 penetrated the slot 7010 formed in the longitudinal direction center section of the slider 701 at the cross direction, and was held free [ movement to a cross direction ] at the slider 701, and a plate 711, the above-mentioned connection board 104 fixed at the nose of cam of a plate 711, and the connection board 104 -- member 102a and interposition -- it consists of a member 103 and a spring which is not illustrated This spring is energizing the plate 711 to back among drawing 12 .

[0074] the support-plate mechanical component 720 was fixed to the above-mentioned support plate 105 and support plate 105 which were fixed at the nose of cam of a cam follower 722 and a plate 721 established in the end face of the plate 721 which penetrated the slot 7010 of a slider 701 and was held free [ movement to a cross direction ] at the slider 701, and a plate 721 -- bending -- passing -- prevention -- it consists of member 102b and a spring which is not illustrated This spring is energizing

the plate 721 to back among drawing 12 .

[0075] Cam followers 712 and 722 are individually forced with two springs described above to the cam side 731 where the end face was prepared in the link 730 connected with the slider electrode holder 702. The nose of cam of a link 730 is forced with two springs described above to the second cam side 602 of a cam drum 600, or another spring which is not illustrated.

[0076] If a revolution drive is clockwise carried out by the rotation drive which this link mechanism object 700 does not illustrate and a cam follower 705 moves to a path outside (front) in drawing 13 along the cam side 601 of the periphery of a cam drum 600, a slider 701 will move below and the connection board mechanical component 710 and the support-plate mechanical component 720 which were attached in the slider 701 will also be displaced below with it.

[0077] if a cam follower 705 moves to the path outside (front) of drawing 13 after all -- a slider 701 -- caudad -- moving -- bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- a member 103 moves below

[0078] moreover -- if the part of the cam side 601 where a cam follower 705 contacts serves as \*\*\*\* -- reverse -- bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- a member 103 returns upwards

[0079] Next, if a revolution drive is clockwise carried out by the rotation drive which this link mechanism object 700 does not illustrate and a cam follower 731 moves to a path outside (front) in drawing 13 along the second cam side 602 of the periphery of a cam drum 600 a link 730 -- drawing 12 - setting -- a clockwise rotation -- rotating -- the cam side 731 -- the front -- displacing -- thereby -- cam followers 712 and 722 -- leading -- bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- a member 103 is projected to the front

[0080] moreover -- if the part of the second cam side 602 where a cam follower 731 contacts serves as \*\*\*\* -- reverse -- bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- a member 103 returns back

[0081] If the profile of the above-mentioned cam sides 601 and 602 is specified for every arbitrary angular positions of a cam drum 600, when the link mechanism object 700 rotates about 180 degrees of a cam drum 600, each process which gave [ above-mentioned ] explanation can be performed one by one.

[0082] The link mechanism object 700 the periphery of a cam drum 600 in and the stage which carried out the abbreviation semicircle from the angular position of drawing 12 bending -- member 102a -- bending -- passing -- prevention -- member 102b and interposition -- a pine [ finishing / formation / if a member 103 is retreated ] -- foliaceous -- a conductor It can fall with the posture over it to the chute member (not shown) of the shape for example, of sheet metal by the posture which made the leg nose of cam the lower part, and can discharge with a self-weight along with this chute member.

[0083] In addition, it is desirable to arrange in a hoop direction the link mechanism object 700 of the maximum number which a space allows around a cam drum 600 in respect of the improvement in productive efficiency.

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[Translation done.]